

WHAT IS CLAIMED IS:

1. A control method of an EGR system for recirculating part of an exhaust gas into an air supply circuit via an EGR valve provided at an EGR passage for connecting said air supply circuit and an exhaust circuit of an engine, comprising the steps of:
 - (a) obtaining, at each predetermined time interval, a flow rate of air, which is taken into the engine in an operational state at the time;
 - (b) detecting an engine speed, a fuel flow rate, and a difference in pressure in front of and behind the EGR valve, in said operational state;
 - (c) obtaining a target EGR valve opening degree in said operational state from relationship of the target EGR valve opening degree, which is previously set, corresponding to the detected engine speed and the detected fuel flow rate;
 - (d) obtaining a virtual EGR gas flow rate from the detected pressure difference and the target EGR valve opening degree in said operational state;
 - (e) obtaining a virtual EGR rate from the obtained air flow rate, the detected fuel flow rate, and the virtual EGR gas flow rate;
 - (f) obtaining a target EGR rate in said operational state from relationship of the target EGR rate, which is previously

set, corresponding to the detected engine speed and the detected fuel flow rate;

(g) obtaining an EGR valve opening degree correction coefficient in said operational state from relationship of the EGR valve opening degree correction coefficient, which is previously set, corresponding to a difference or a ratio of the virtual EGR rate and the target EGR rate;

(h) obtaining a command EGR valve opening degree to be used for an actual control from the EGR valve opening degree correction coefficient in said operational state, and the target EGR valve opening degree in said operational state; and

(i) operating an actuator for driving said EGR valve to attain the command EGR valve opening degree.

2. A control method of an EGR system which has an EGR valve provided at an EGR passage for connecting an air supply circuit and an exhaust circuit of an engine, a bypass circuit for connecting said air supply circuit and said exhaust circuit to equalize air supply pressure and exhaust pressure, and a bypass valve provided at said bypass circuit, and recirculates part of an exhaust gas into said air supply circuit via said EGR valve, comprising the steps of:

(a) obtaining, at each predetermined time interval, a flow rate of air, which is taken into the engine in an operational state at the time;

(b) detecting an engine speed, a fuel flow rate, and a difference in pressure in front of and behind the EGR valve, in said operational state;

(c) obtaining a target EGR valve opening degree in said
5 operational state from relationship of the target EGR valve opening degree, which is previously set, corresponding to the detected engine speed and the detected fuel flow rate;

(d) obtaining a virtual EGR gas flow rate from the detected pressure difference and the target EGR valve opening
10 degree in said operational state;

(e) obtaining a virtual EGR rate from the obtained air flow rate, the detected fuel flow rate, and the virtual EGR gas flow rate;

(f) obtaining a target EGR rate in said operational state
15 from relationship of the target EGR rate, which is previously set, corresponding to the detected engine speed and the detected fuel flow rate;

(g) obtaining a bypass valve opening degree correction coefficient in said operational state from relationship of the
20 bypass valve opening degree correction coefficient, which is previously set, corresponding to a difference or a ratio of the virtual EGR rate and the target EGR rate;

(h) obtaining a target bypass valve opening degree in said operational state from relationship of the target bypass
25 valve opening degree, which is previously set, corresponding to

the detected engine speed and the detected fuel flow rate;

(i) obtaining a command bypass valve opening degree to be used for an actual control from the bypass valve opening degree correction coefficient in said operational state, and the
5 target bypass valve opening degree in said operational state;
and

(j) operating an actuator for driving said bypass valve to attain the command bypass valve opening degree.